

Project Concept:
Validation and Improvement of
Vertical Mixing and Surface
Fluxes

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TERC Strategic Plan

- 2.3 Vertical Mixing
 - Parameter estimation
 - Ensemble Kalman Filter
 - Sea breeze dynamics
- 2.4 Long-Range Transport
 - Dynamics of the nocturnal jet
- 6.6 Air Quality Modeling Improvement
 - Vertical Mixing
 - Data assimilation

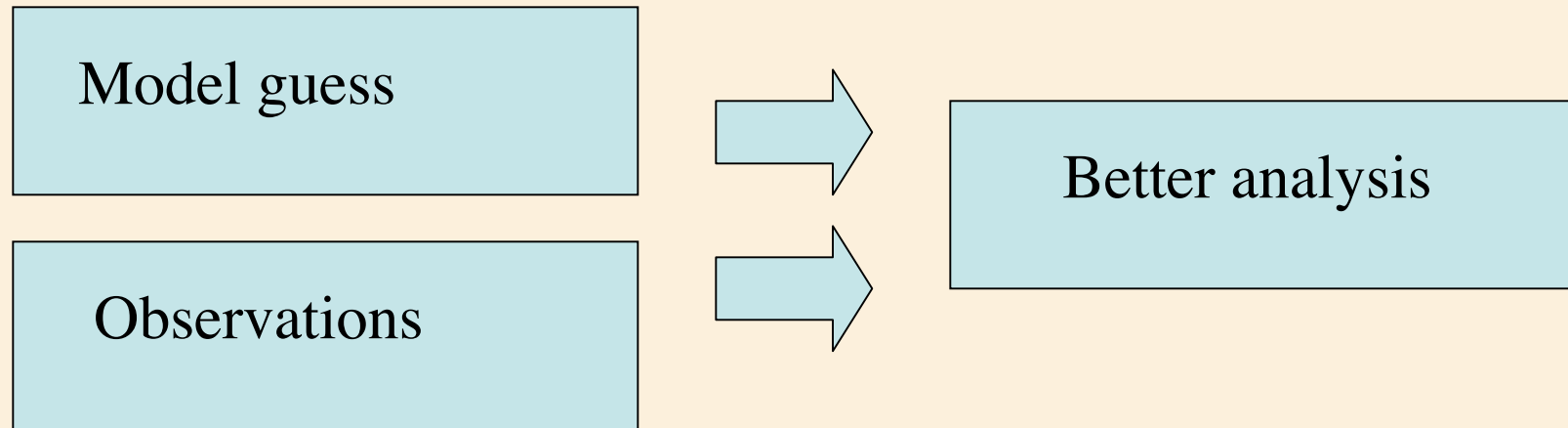
TERC Strategic Plan

- Outstanding Pressing Need #2:
 - Accurately representing the physical and chemical details governing long-range transport of pollution

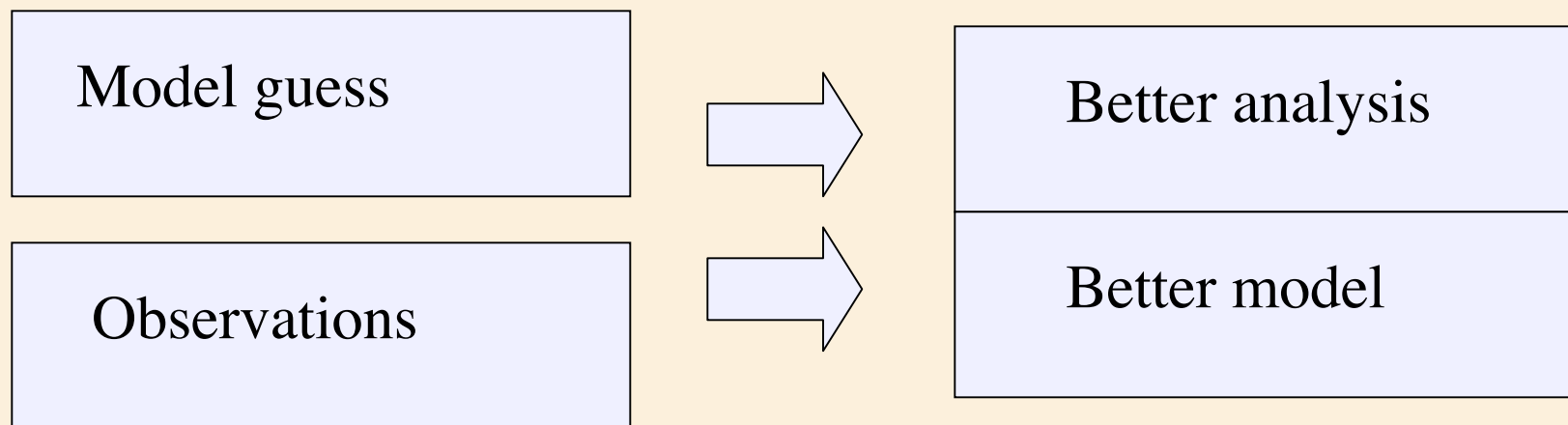
Project Concept

- Improvements needed in models
 - Wind speed and direction
 - Precipitation
 - Mixing heights
- Data assimilation with Ensemble Kalman Filter can address most of these issues
 - Old way: plug and chug
 - New idea: observation-driven model improvement

Conventional Data Assimilation



Parameter Estimation



Phase 1

- Adapt ACM2 scheme to maximize flexible tunable parameters within physical constraints (with Jon Pleim)
- Assimilate wind profile information from profilers and lidars
- (Parallel project under development with TCEQ: assimilate NEXRAD winds)

Phase 2

- Detailed analysis of mixing height distribution
- Direct assimilation of mixing height information
- Further improvement of ACM2 scheme

Phase 3

- Include land surface characteristics as part of model state vector
- Assimilate surface temperature and moisture and vertical profiles
- Through EnKF, improve coupled surface flux-vertical mixing system

Benefits and Relevance

- Substantial improvement in the accuracy of meteorological simulations
- Substantial improvements in all future chemistry simulations that use meteorology as a driver
- Improved simulations of nighttime ventilation and transport
- Improved understanding and representation of sea breeze and low-level jet phenomena